



U. S. Department of Justice

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## Test record

ASCLD/LAB-*International* Testing Accreditation  
Certificate ALI-217-T

|                   |                     |                  |   |
|-------------------|---------------------|------------------|---|
| <b>Title</b>      | Pan Fires In Corner |                  |   |
| <b>Test Type</b>  | Fire behavior       |                  |   |
| <b>Lab Number</b> | ATFFRL050003-1      |                  |   |
| <b>Test dates</b> | 10/21/05            | <b>No. Tests</b> | 6 |

### *Thermocouples*

Thermocouples are temperature measurement sensors that consist of two dissimilar metals joined at one end (a junction) that produces a small thermo-electrical voltage when the wire is heated. The change in voltage is interpreted as a change in temperature [1]. There are many configurations of thermocouples which affect the temperature range, ruggedness, and response time. The information required to identify these factors for the thermocouples that were used during the experiment(s) conducted for this test series is provided in the "Thermocouple Measurement Description" table.

Thermocouples used during this test series were used in accordance with the method defined in FRL laboratory instruction "LI001 Thermocouple" [2].

The following table provides a description of the instrumentation used to collect the temperature measurements during the experiments. The "Description" column describes the location of the temperature measurement. The "Thermocouple Type" describes the characteristics of the thermocouple used.

Table 1. Thermocouple Measurement Description

| Description | Thermocouple type                       |
|-------------|---|
| 25 cm       | Type K, Inconel, 1/8 in. dia, Grounded  |
| 50 cm       | Type K, Inconel, 1/8 in. dia, Grounded  |
| 75 cm       | Type K, Inconel, 1/8 in. dia, Grounded  |
| 100 cm      | Type K, Inconel, 1/8 in. dia, Grounded  |
| 125 cm      | Type K, Inconel, 1/8 in. dia, Grounded  |
| 150 cm      | Type K, Inconel, 1/8 in. dia, Grounded  |
| 175 cm      | Type K, Inconel, 1/8 in. dia, Grounded  |
| 200 cm      | Type K, Inconel, 1/8 in. dia, Grounded  |
| ground      | Type K, Inconel, 1/16 in. dia, Grounded |

### *Height Indicator*

The standard height indicator used at ATF Fire Research Laboratory is constructed with 12.8 mm (0.5 inch) diameter 250 mm (9.8 inch) long metal indicators mounted on a metal support at a 250 mm (9.8 inch) spacing. A schematic and a picture of a height indicator are shown in Figure 1.



**Figure 1. Schematic and picture of height indicator**

### ***Experiment Photographs***

Digital Cameras are used within the FRL to record digital still photographs during experiments. Digital Cameras used during this test series were used in accordance with the method defined in FRL Laboratory Instruction “LI003 Digital Cameras” [3].

## Results for Test 12 (ID 1783)

The following table provides a summary of the temperature results. The “Initial” column provides the measured temperature at the beginning of the test. The maximum temperature recorded during the test is provided in the “Max” column. The remaining columns provide the calculated maximum average temperatures.

Table 2. Temperature Value Result Summary

| Description | Initial (C) | Max (C) | 30 second maximum average (C) | 60 second maximum average (C) | 300 second maximum average (C) | 600 second maximum average (C) |
|-------------|-------------|---------|-------------------------------|-------------------------------|--------------------------------|--------------------------------|
| 25 cm       | 16          | 644     | 635                           | 622                           | 541                            | 296                            |
| 50 cm       | 15          | 527     | 520                           | 510                           | 443                            | 241                            |
| 75 cm       | 15          | 42      | 42                            | 41                            | 37                             | 21                             |
| 100 cm      | 15          | 43      | 42                            | 42                            | 36                             | 20                             |
| 125 cm      | 14          | 34      | 34                            | 34                            | 30                             | 17                             |
| 150 cm      | 14          | 34      | 34                            | 33                            | 30                             | 17                             |
| 175 cm      | 14          | 33      | 33                            | 33                            | 29                             | 16                             |
| 200 cm      | 14          | 34      | 34                            | 34                            | 30                             | 17                             |
| ground      | 12          | 725     | 687                           | 684                           | 660                            | 373                            |

The following chart(s) present a time-dependent representation of the instantaneous temperatures measured during the experiment.

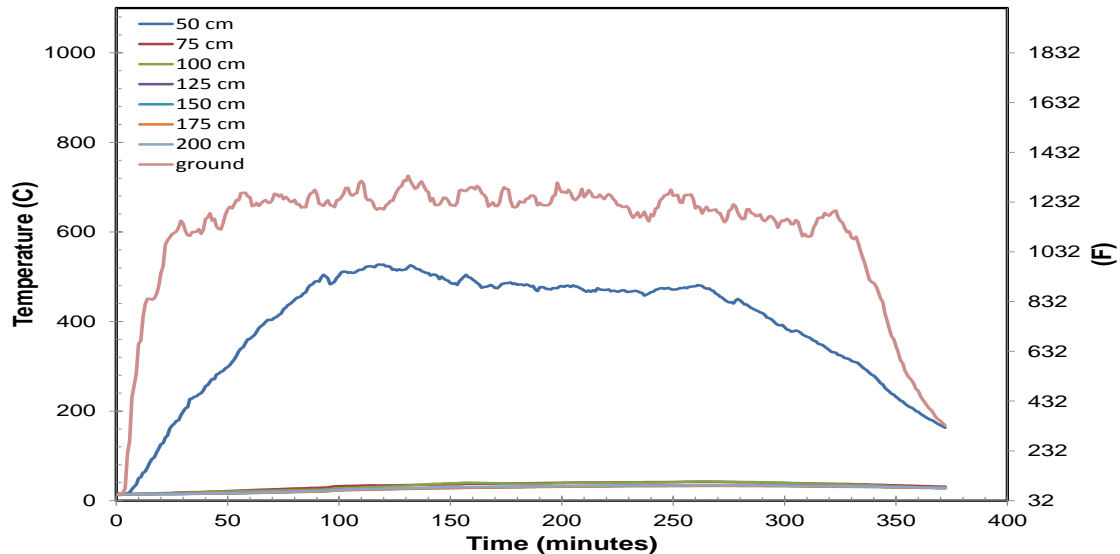


Figure 2. Temperature

The following figures show all of the still photographs uploaded into the FireTOSS system. The caption below each figure provides the picture’s filename as well as any description and elapsed test time associated with the picture.



Figure 3. PRE (0:00  
hr:min),  
1783\_26574



Figure 4. 2,  
1783\_26575



Figure 5. 5,  
1783\_26576



Figure 6. 6,  
1783\_26577



Figure 7. 8,  
1783\_26578



Figure 8. 13,  
1783\_26579



Figure 9. 22,  
1783\_26580



Figure 10. 24,  
1783\_26581



Figure 11. 47,  
1783\_26582



Figure 12. 51,  
1783\_26583



Figure 13. 59,  
1783\_26584



Figure 14. 109,  
1783\_26585



Figure 15. 111,  
1783\_26586



Figure 16. 113,  
1783\_26587

## Results for Test 13 (ID 1784)

The following table provides a summary of the temperature results. The “Initial” column provides the measured temperature at the beginning of the test. The maximum temperature recorded during the test is provided in the “Max” column. The remaining columns provide the calculated maximum average temperatures.

Table 3. Temperature Value Result Summary

| Description | Initial (C) | Max (C) | 30 second maximum average (C) | 60 second maximum average (C) | 300 second maximum average (C) | 600 second maximum average (C) |
|-------------|-------------|---------|-------------------------------|-------------------------------|--------------------------------|--------------------------------|
| 25 cm       | 16          | 691     | 667                           | 666                           | 511                            | 257                            |
| 50 cm       | 16          | 553     | 540                           | 535                           | 396                            | 199                            |
| 75 cm       | 15          | 75      | 72                            | 71                            | 52                             | 26                             |
| 100 cm      | 15          | 78      | 76                            | 74                            | 52                             | 27                             |
| 125 cm      | 15          | 70      | 69                            | 68                            | 49                             | 25                             |
| 150 cm      | 15          | 69      | 68                            | 67                            | 48                             | 24                             |
| 175 cm      | 15          | 67      | 66                            | 65                            | 47                             | 24                             |
| 200 cm      | 15          | 68      | 67                            | 66                            | 47                             | 24                             |
| ground      | 15          | 739     | 713                           | 703                           | 575                            | 289                            |

The following chart(s) present a time-dependent representation of the instantaneous temperatures measured during the experiment.

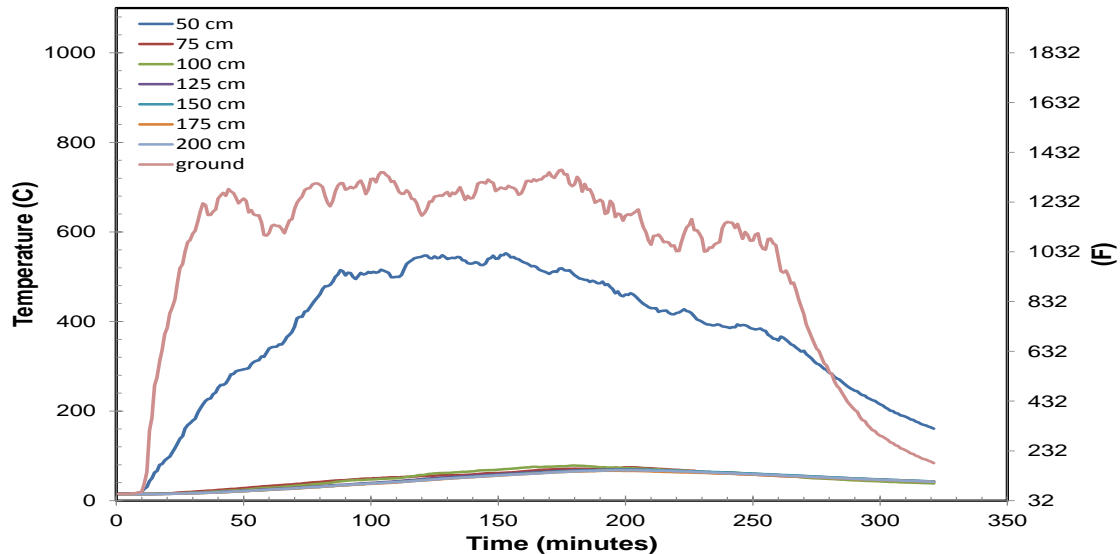


Figure 17. Temperature

The following figures show all of the still photographs uploaded into the FireTOSS system. The caption below each figure provides the picture’s filename as well as any description and elapsed test time associated with the picture.



Figure 18. PRE  
(0:00 hr:min),  
1784\_26612



Figure 19. PRE  
(0:00 hr:min),  
1784\_26613



Figure 20. PRE  
(0:00 hr:min),  
1784\_26614



Figure 21. PRE  
(0:00 hr:min),  
1784\_26615



Figure 22. 1,  
1784\_26616



Figure 23. 17,  
1784\_26617



Figure 24. 57,  
1784\_26618



Figure 25. 66,  
1784\_26619



Figure 26. 75,  
1784\_26620



Figure 27. 85,  
1784\_26621



Figure 28. 91,  
1784\_26622



Figure 29. 100,  
1784\_26623



Figure 30. 109,  
1784\_26624



Figure 31. 155,  
1784\_26625



Figure 32. 158,  
1784\_26626



Figure 33. 161,  
1784\_26627



Figure 34. 163,  
1784\_26628



Figure 35. 170,  
1784\_26629



Figure 36. 173,  
1784\_26630



Figure 37. 199,  
1784\_26631



Figure 38. 247,  
1784\_26632



Figure 39. 250,  
1784\_26633



Figure 40. 259,  
1784\_26634

## Results for Test 14 (ID 1785)

The following table provides a summary of the temperature results. The “Initial” column provides the measured temperature at the beginning of the test. The maximum temperature recorded during the test is provided in the “Max” column. The remaining columns provide the calculated maximum average temperatures.

Table 4. Temperature Value Result Summary

| Description | Initial (C) | Max (C) | 30 second maximum average (C) | 60 second maximum average (C) | 300 second maximum average (C) | 600 second maximum average (C) |
|-------------|-------------|---------|-------------------------------|-------------------------------|--------------------------------|--------------------------------|
| 25 cm       | 20          | 743     | 702                           | 669                           | 408                            | 214                            |
| 50 cm       | 20          | 622     | 598                           | 580                           | 351                            | 185                            |
| 75 cm       | 19          | 82      | 80                            | 79                            | 53                             | 36                             |
| 100 cm      | 17          | 84      | 78                            | 76                            | 51                             | 34                             |
| 125 cm      | 17          | 71      | 70                            | 69                            | 46                             | 31                             |
| 150 cm      | 17          | 73      | 73                            | 71                            | 46                             | 32                             |
| 175 cm      | 17          | 71      | 71                            | 70                            | 46                             | 32                             |
| 200 cm      | 17          | 71      | 70                            | 69                            | 46                             | 31                             |
| ground      | 13          | 682     | 654                           | 622                           | 368                            | 191                            |

The following chart(s) present a time-dependent representation of the instantaneous temperatures measured during the experiment.

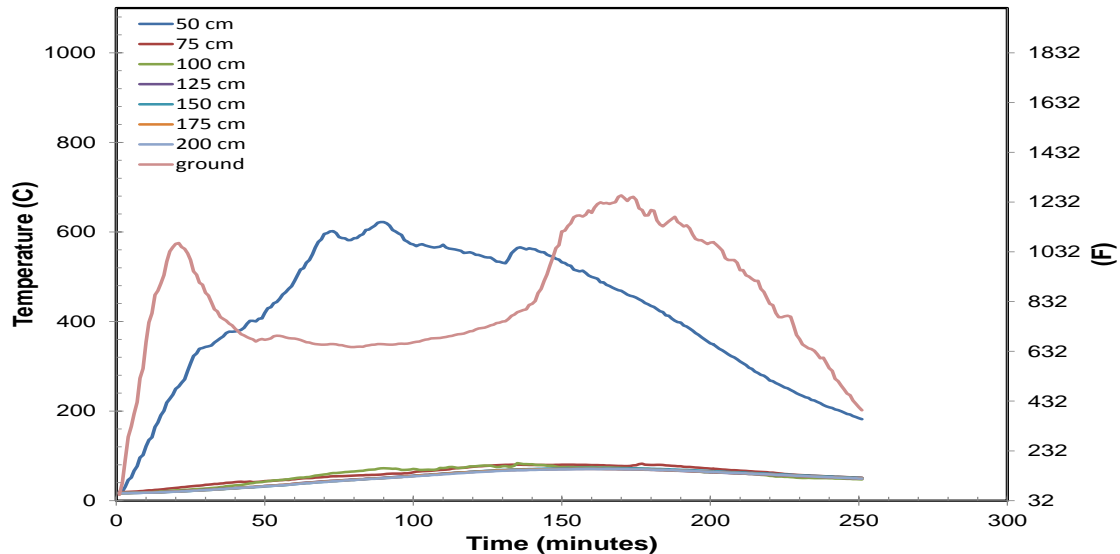


Figure 41. Temperature

The following figures show all of the still photographs uploaded into the FireTOSS system. The caption below each figure provides the picture’s filename as well as any description and elapsed test time associated with the picture.





Figure 42. 12,  
1785\_26663



Figure 43. 36,  
1785\_26664



Figure 44. 119,  
1785\_26666



Figure 45. 182,  
1785\_26668



## Results for Test 15 (ID 1789)

The following table provides a summary of the temperature results. The “Initial” column provides the measured temperature at the beginning of the test. The maximum temperature recorded during the test is provided in the “Max” column. The remaining columns provide the calculated maximum average temperatures.

Table 5. Temperature Value Result Summary

| Description | Initial (C) | Max (C) | 30 second maximum average (C) | 60 second maximum average (C) | 300 second maximum average (C) | 600 second maximum average (C) |
|-------------|-------------|---------|-------------------------------|-------------------------------|--------------------------------|--------------------------------|
| 25 cm       | 15          | 775     | 761                           | 749                           | 514                            | 265                            |
| 50 cm       | 15          | 659     | 652                           | 647                           | 418                            | 217                            |
| 75 cm       | 15          | 74      | 73                            | 71                            | 49                             | 32                             |
| 100 cm      | 15          | 72      | 70                            | 69                            | 47                             | 31                             |
| 125 cm      | 14          | 60      | 60                            | 59                            | 41                             | 28                             |
| 150 cm      | 14          | 61      | 61                            | 60                            | 41                             | 28                             |
| 175 cm      | 14          | 60      | 59                            | 58                            | 41                             | 27                             |
| 200 cm      | 14          | 60      | 60                            | 58                            | 40                             | 27                             |
| ground      | 13          | 684     | 666                           | 630                           | 356                            | 184                            |

The following chart(s) present a time-dependent representation of the instantaneous temperatures measured during the experiment.

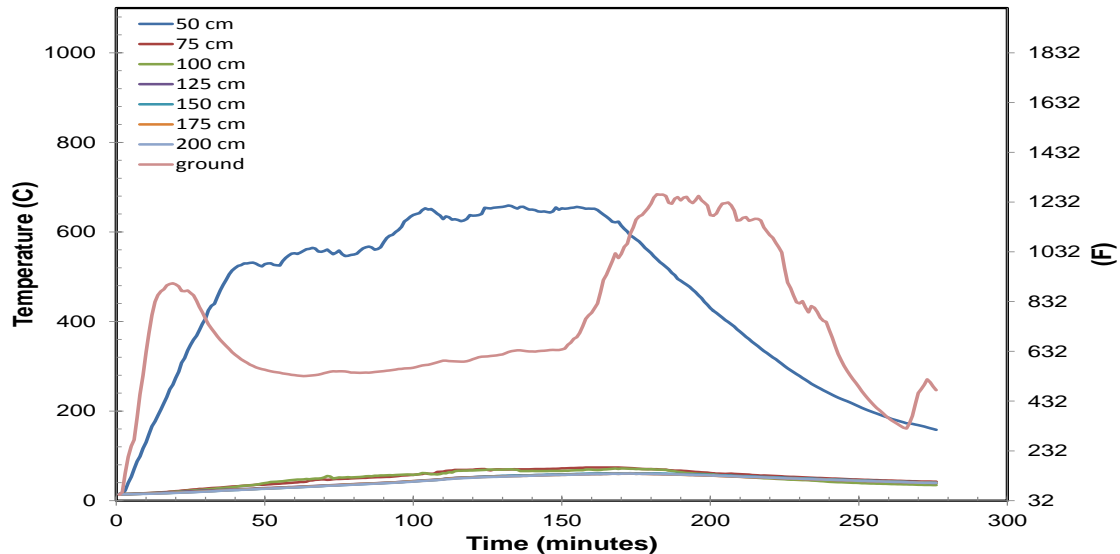


Figure 46. Temperature

The following figures show all of the still photographs uploaded into the FireTOSS system. The caption below each figure provides the picture’s filename as well as any description and elapsed test time associated with the picture.



Figure 47. PRE  
(0:00 hr:min),  
1789\_26669



Figure 48. PRE  
(0:00 hr:min),  
1789\_26670



Figure 49. 6,  
1789\_26671



Figure 50. 11,  
1789\_26672

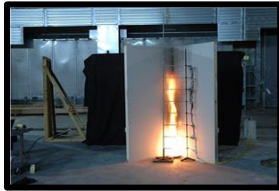


Figure 51. 15,  
1789\_26673



Figure 52. 18,  
1789\_26674



Figure 53. 23,  
1789\_26675



Figure 54. 25,  
1789\_26676



Figure 55. 28,  
1789\_26677



Figure 56. 30,  
1789\_26678



Figure 57. 38,  
1789\_26679



Figure 58. 52,  
1789\_26680



Figure 59. 54,  
1789\_26681



Figure 60. 60,  
1789\_26682



Figure 61. 86,  
1789\_26683



Figure 62. 90,  
1789\_26684



Figure 63. 97,  
1789\_26685



Figure 64. 100,  
1789\_26686



Figure 65. 126,  
1789\_26687



Figure 66. 132,  
1789\_26688



Figure 67. 148,  
1789\_26689

## Results for Test 16 (ID 1790)

The following table provides a summary of the temperature results. The “Initial” column provides the measured temperature at the beginning of the test. The maximum temperature recorded during the test is provided in the “Max” column. The remaining columns provide the calculated maximum average temperatures.

Table 6. Temperature Value Result Summary

| Description | Initial (C) | Max (C) | 30 second maximum average (C) | 60 second maximum average (C) | 300 second maximum average (C) | 600 second maximum average (C) |
|-------------|-------------|---------|-------------------------------|-------------------------------|--------------------------------|--------------------------------|
| 25 cm       | 21          | 864     | 836                           | 815                           | 377                            | 188                            |
| 50 cm       | 21          | 887     | 855                           | 844                           | 363                            | 181                            |
| 75 cm       | 20          | 909     | 863                           | 735                           | 191                            | 95                             |
| 100 cm      | 17          | 186     | 180                           | 176                           | 79                             | 40                             |
| 125 cm      | 18          | 110     | 109                           | 107                           | 53                             | 27                             |
| 150 cm      | 18          | 157     | 148                           | 141                           | 64                             | 32                             |
| 175 cm      | 18          | 112     | 109                           | 105                           | 54                             | 27                             |
| 200 cm      | 17          | 143     | 139                           | 133                           | 63                             | 32                             |
| ground      | 16          | 803     | 777                           | 712                           | 322                            | 161                            |

The following chart(s) present a time-dependent representation of the instantaneous temperatures measured during the experiment.

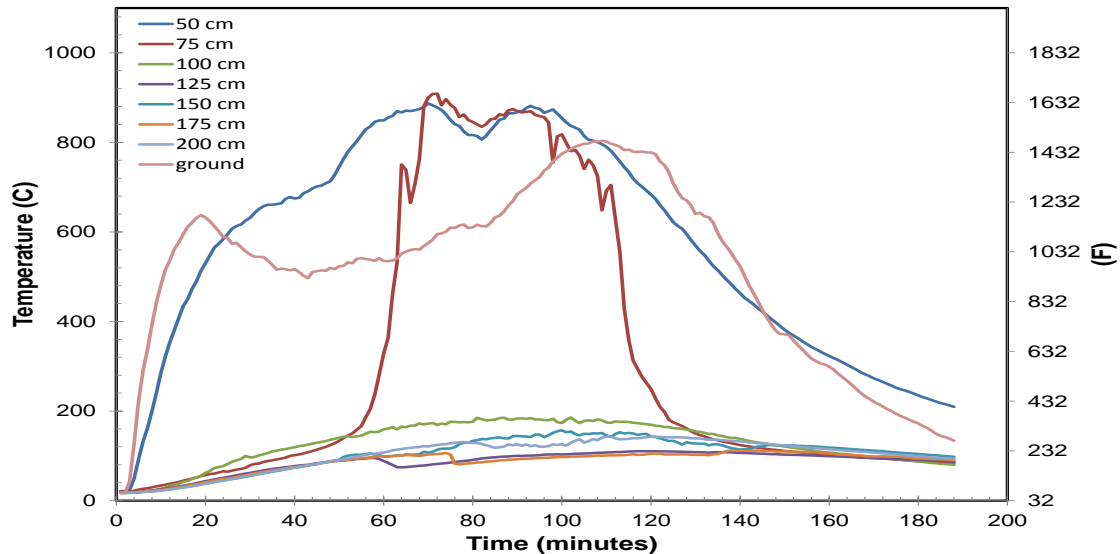


Figure 68. Temperature

The following figures show all of the still photographs uploaded into the FireTOSS system. The caption below each figure provides the picture’s filename as well as any description and elapsed test time associated with the picture.



Figure 69. PRE  
(0:00 hr:min),  
1790\_26736



Figure 70. PRE  
(0:00 hr:min),  
1790\_26737



Figure 71. 35,  
1790\_26738



Figure 72. 38,  
1790\_26739



Figure 73. 66,  
1790\_26740



Figure 74. 69,  
1790\_26741



Figure 75. 108,  
1790\_26744

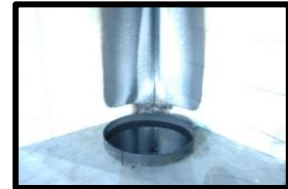


Figure 76. POST  
(0:01 hr:min),  
1790\_26745



Figure 77. POST  
(0:02 hr:min),  
1790\_26746



Figure 78. POST  
(0:02 hr:min),  
1790\_26747

## Results for Test 17 (ID 1791)

The following table provides a summary of the temperature results. The “Initial” column provides the measured temperature at the beginning of the test. The maximum temperature recorded during the test is provided in the “Max” column. The remaining columns provide the calculated maximum average temperatures.

Table 7. Temperature Value Result Summary

| Description | Initial (C) | Max (C) | 30 second maximum average (C) | 60 second maximum average (C) | 300 second maximum average (C) | 600 second maximum average (C) |
|-------------|-------------|---------|-------------------------------|-------------------------------|--------------------------------|--------------------------------|
| 25 cm       | 20          | 860     | 848                           | 826                           | 354                            | 177                            |
| 50 cm       | 18          | 858     | 842                           | 819                           | 337                            | 169                            |
| 75 cm       | 19          | 771     | 721                           | 621                           | 171                            | 86                             |
| 100 cm      | 17          | 188     | 182                           | 174                           | 75                             | 37                             |
| 125 cm      | 17          | 109     | 108                           | 105                           | 53                             | 26                             |
| 150 cm      | 17          | 173     | 162                           | 155                           | 68                             | 34                             |
| 175 cm      | 17          | 117     | 112                           | 108                           | 55                             | 28                             |
| 200 cm      | 17          | 148     | 144                           | 142                           | 65                             | 33                             |
| ground      | 19          | 712     | 663                           | 568                           | 228                            | 114                            |

The following chart(s) present a time-dependent representation of the instantaneous temperatures measured during the experiment.

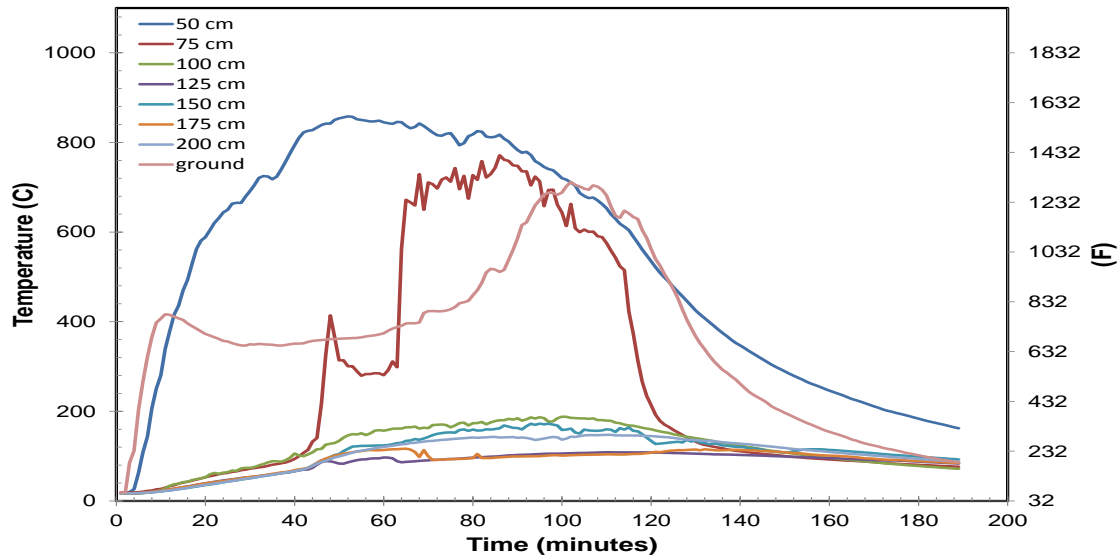


Figure 79. Temperature

The following figures show all of the still photographs uploaded into the FireTOSS system. The caption below each figure provides the picture’s filename as well as any description and elapsed test time associated with the picture.



Figure 80. PRE  
(0:00 hr:min),  
1791\_26710



Figure 81. PRE  
(0:00 hr:min),  
1791\_26711



Figure 82. 10,  
1791\_26712



Figure 83. 19,  
1791\_26713



Figure 84. 39,  
1791\_26714



Figure 85. 42,  
1791\_26715



Figure 86. 63,  
1791\_26716

## **References**

1. The Temperature Handbook, 2nd edition, Omega Engineering, Stamford, CT, 2000.
2. Laboratory Instruction LI001 - Thermocouple, Bureau of Alcohol, Tobacco, Firearms and Explosives – Fire Research Laboratory, Beltsville, MD.
3. Laboratory Instruction LI003 - Digital Cameras, Bureau of Alcohol, Tobacco, Firearms and Explosives - Fire Research Laboratory, Beltsville, MD